ALASKA AGRICULTURAL EXPERIMENT STATIONS, JUNEAU, SITKA, MATANUSKA, FAIRBANKS, AND KODIAK

[Under the supervision of the Office of Experiment Stations, United States Department of Agriculture]

JAMES T. JARDINE, *Chief, Office of Experiment Stations.*
WALTER H. EVANS, *Chief, Division of Insular Stations, Office of Experiment Stations.*

STATION STAFF

H. W. ALBERTS, *Director.*
C. CORDY, *Horticulturist, Sitka.*
F. L. HIGGINS, *Agronomist, Matanuska.*
F. B. LINN, *Assistant Animal Husbandman, Matanuska.*
W. T. WHITE, *Animal Husbandman, Matanuska.*
J. C. WINGFIELD, *Horticulturist, Matanuska.*
EILER HANSEN, *Administrative Assistant.*

ALASKA AGRICULTURAL EXPERIMENT STATIONS

JUNEAU, ALASKA

Under the supervision of the
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REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS, 1931, 1932

CONTENTS

REPORT OF THE DIRECTOR

REVIEW OF WORK, 1898–1932

The fiscal year ended June 30, 1932, marked the closing of the Alaska agricultural experiment stations as originated under the direct control of the United States Department of Agriculture. The rapid growth and development of agriculture in Alaska has been due in large measure to the stimulus received from these stations during the past 34 years. Comparatively little was known about the agricultural possibilities of Alaska when the United States purchased the vast Territory from Russia in 1867. Under the Russian régime sporadic attempts were made to promote agriculture, but nothing of a permanent nature was accomplished.

In 1897 the Secretary of Agriculture was authorized to investigate and report to Congress on the agricultural resources and capabilities of Alaska, with special reference to the desirability and feasibility of establishing agricultural experiment stations there. The investigations were limited that year to reconnaissance surveys in the Territory by Walter H. Evans, representing the United States Department of Agriculture, Benton Killin, of Portland, Oreg., and Sheldon Jackson, of the United States Department of the Interior. Doctor Evans and Mr. Killin visited southeastern Alaska and the Cook Inlet region, the former continuing his trip to southwestern Alaska as far as Unalaska. Doctor Jackson went to the Yukon Valley. Practically every settlement in the Territory was visited, and data were collected on soils, climate, native and introduced economic plants, and livestock. As a result of the report to Congress on the reconnaissance surveys, provision was made for continuing the investigations, and in 1898 the Territory was again visited with a view to the selection

of localities appearing to offer advantages for experimental work in agriculture.

Some preliminary experimental work was begun in Alaska in 1898, and in 1899 Congress authorized the establishment and maintenance of agricultural experiment stations in the Territory, including the erection of buildings essential to their needs. Each station was located in a region that differed from all other regions in latitude, climate, temperature, and prevailing economic conditions. Table 1 records the station reservations, their areas, and the date of the Executive order reserving them.

TABLE 1.—*Record of station reservations in Alaska, their areas, and the date of the Executive order reserving them*

Executive Order No.	Date of the order	Reservation	Area
			Acres
	Mar. 28, 1898	Kodiak	[1] 160
	July 18, 1898 [2]	Sitka headquarters	[3] 1.3
	Aug. 12, 1898	Sitka	[4] 110
	Jan. 21, 1899	Kenai	320
1023	Feb. 6, 1900	Rampart	313
	Apr. 25, 1903 [5]	Copper Center	775
	Mar. 22, 1906	Fairbanks	1,400
1512	Apr. 1, 1912	Near Island	330
1513	do	Kalsin Bay	3,000
2247	Sept. 20, 1915	Matanuska	240
2658	July 10, 1917	do	640
3384	Jan. 12, 1921	Kenai	[6] 4
3678	May 20, 1922	Kodiak	[7] 336
3924	Nov. 9, 1923	Matanuska	40
4812	Feb. 21, 1928	Fairbanks	280

[1] Reduced to 133 acres Sept. 29, 1920 (U. S. Survey No. 1272).
[2] Actual experiments were under way at Sitka before the station site was definitely located.
[3] U. S. Survey No. 1473, Oct. 21, 1924.
[4] See U. S. Dept. Agr., Off. Expt. Stas. Bul. 62, facing p. 10.
[5] Final reservation Executive Order No. 1030, Feb. 24, 1909.
[6] Restoration of 316 acres to public domain.
[7] U. S. Survey No. 1389, Feb. 9, 1922.

Experimental work was begun in 1898 at Sitka, Baranoff Island, on land that had to be cleared, broken, and put in condition for cultivation. Sitka was then the center of population and the seat of government. A building site, locally known as Castle Hill, was reserved for use as headquarters for the director of the station. In 1900 the seat of government was transferred from Sitka to Juneau, but Sitka continued to be used as the headquarters of the station until October 1, 1931, when they were transferred to Juneau. Experiments with fruits, vegetables, and ornamental plants were conducted at Sitka to meet the requirements of the coast region. This region proved to be unfavorable for grain growing and for livestock raising. The Sitka station was closed June 30, 1932.

In 1898 the Kodiak station, Kodiak Island, undertook experiments to determine the practicability of raising cattle in the grazing regions of southwestern Alaska. Climatic conditions at Kodiak are very different from those at Sitka. The leading work undertaken at the Kodiak station was cattle breeding. This region has not yet been stocked with livestock, chiefly because of the lack of transportation facilities, but cattle can be maintained there on pasture and hay or silage made from native grasses. The Kodiak station was closed June 30, 1931.

In 1899 experimental work was begun at the Kenai station on the west side of the Kenai Peninsula. Kenai was found to be better suited to livestock breeding than to general farming, and the work was therefore concentrated on cattle breeding with a view to commercial dairying. Some butter and cheese was manufactured on a small scale. The Kenai station was closed in the spring of 1908.

In 1900 the Rampart station, on the Yukon River and less than 1° from the Arctic Circle, was established. This station was devoted almost entirely to grain breeding and to the development of hardy legumes. Among the crops of less importance grown were potatoes, strawberries and other small fruits, and the usual kinds of hardy vegetables. The Rampart station was closed in the summer of 1925.

In 1903 experimental work was begun at the Copper Center station, in the Copper River Valley. The station was devoted to the growing of vegetables, grasses, and the earliest varieties of grain that could be found. A killing frost invariably occurred about the middle of August, and all grains that had not matured then had to be cut for hay. The Copper Center station was closed in 1908.

In 1906 the Fairbanks station, in the fertile Tanana Valley, was established. The Fairbanks station was operated as a model farm where the farmer had opportunity to familiarize himself with the best varieties of grain, with the most effective cultural practices, and with methods for maintaining soil fertility. The Fairbanks station was transferred May 1, 1931, to the Alaska Agricultural College and School of Mines, at Fairbanks.

In 1915 work at the Matanuska station, in the heart of the Matanuska Valley, was begun. The station specialized in cattle breeding and in grain growing, with emphasis on the production of feed for livestock. The Matanuska station was transferred to the Alaska Agricultural College and School of Mines July 21, 1932.

When the first stations were established the agricultural problems of Alaska were new. Nowhere else in the United States had similar climatic conditions been encountered. Transportation facilities along the coast and on the Yukon were very meager, and on land there were almost no roads and comparatively few trails. The pioneer farmer had much to learn about the climate, the soil, methods of culture, and the things that could best and most profitably be grown. The stations rendered excellent service in aiding these farmers by cooperating with them in their work, by disseminating agricultural information among them, and by introducing and propagating for distribution to all parts of the Territory improved plants of economic value and all kinds of nursery stock.

No attempts had been made to grow grains in Alaska up to the time the stations were established, chiefly because of a conviction that they could not be grown. The stations made the first introductions of grain into the Territory and fully demonstrated the adaptability of the Yukon, Tanana, and Matanuska Valleys to grain growing. In 1913 the stations secured from Russia a variety of spring wheat known as Siberian No. 1 (Khogot, erroneously spelled "Chogot"), which can be depended on to mature every year. This variety is now grown extensively by the farmers in the Tanana and the Matanuska Valleys. The stations proved that winter rye could be successfully grown to within 1° of the Arctic Circle, and obtained some notable successes through hybridization with early varieties of

spring wheat, barley, and oats. Some of the hybrids are better suited to Alaskan conditions than were the parents. In the interior the stations grew buckwheat for many years.

The potatoes produced in Alaska during the early days were watery and immature. The stations, and more especially the Sitka station, by growing selected varieties under improved methods of culture, succeeded in developing potatoes that are eminently suited to the Territory. The Sitka station also developed some exceptionally fine seedlings from seed balls, and some of the seedlings were tested at the other stations and by settlers. Demonstrations of the value of sprouting potatoes showed that the average difference in time of emergence between plants from sprouted and unsprouted seed was approximately three weeks, with a decided gain in every instance in yield of the sprouted over the unsprouted seed. Potatoes are now successfully grown in all parts of the Territory. In favorable seasons they are grown even far north of the Arctic Circle, but the success of the crop diminishes as one progresses northward.

In 1898 a few vegetables were grown in the coast region of Alaska, but none was grown in the great interior. Hardy varieties were introduced to determine those best adapted to local conditions. These were grown under improved methods of culture and soon began to supplant the local sorts. To-day all kinds of hardy vegetables are grown in all parts of the Territory south of the Arctic Circle, including the interior where the ground is frozen to an unknown depth. The stations demonstrated that hardy vegetables could be grown in this region after the ice receded to a depth of 2 to 3 feet. The Petrowski turnip, seed of which was secured from Finland, develops fully in a short season and can, therefore, be grown 100 miles north of the Arctic Circle.

The stations introduced apple, plum, cherry, peach, apricot, and pear trees into Alaska. These were propagated and distributed first from Sitka and later also at Matanuska, which eventually became the distributing center for nursery stock in the interior.

The stations were engaged for many years in the development of new varieties of small fruits that would prove to be better adapted to Alaskan conditions than were the few native sorts or those introduced from the more southerly latitudes. Currants, raspberries, and gooseberries are now grown along the southern coast and in the interior. Some of the varieties yield abundantly. Other bush fruits tested included wineberries, Logan and other blackberries, huckleberries, blueberries, service berries, dewberries, buffalo berries, and cranberries. The stations introduced at Sitka grapevines of the variety Island Belle. New growth made during the summer invariably winterkilled, even when it was protected.

Strawberry culture in Alaska was unknown when the stations began work. Hardy strains were developed by crossing the native wild berries with introduced kinds. The wild strawberry of the coast region when crossed with introduced commercial varieties, imparted to the resultant hybrids qualities adapting them to Alaskan conditions, particularly in the coast region. The wild strawberry of the interior when used to pollinate standard varieties, produced hybrids showing a high degree of hardiness. In interior Alaska the station hybrids are the only strawberries that survive the rigorous winters.

Alaska is poor in native ornamental plants. The stations introduced and propagated for distribution many ornamental shade trees, hardy shrubs, and flowering plants. In the coast region the trees giving promise of success were maple, sycamore, poplar, larch, mountain-ash, and elm. In the interior ash, maple, boxelder, catalpa, locust, elm, and walnut were under trial. Shrubs doing exceptionally well in the coast region were single-flowered and double-flowered varieties of the Japanese rose, honeysuckle, red-flowering currant, Weigela, and several varieties of spireas. The Japanese rose was hardy also in interior Alaska. In 1923 the stations demonstrated that hardy flowering bulbs could be propagated commercially in Alaska. In the interior the floral display consisted almost entirely of annuals. In the coast region perennial flowers were grown in abundance.

The stations developed hardy varieties of legumes that not only withstood the rigors of winter in the interior but also came on early in the spring, grew rapidly enough during the short summer to provide a satisfactory yield of forage for livestock, and as green manure took the place of the more expensive fertilizers. Field peas and the common vetches proved to be the more important of the annual legumes. They were grown successfully wherever grain crops were grown. Clovers did well anywhere in the coast region. White sweetclover did well in the interior. The stations developed promising strains of alfalfa combining the winter hardiness of the yellow-flowered sort with the rapid growth and the curved seed-pod characters of Grimm. The stations also developed an early maturing strain of the garden pea, variety Alaska, which matured seed every year in the interior. At Fairbanks peas were grown for canning. In 1924 the stations sold 480 pounds of seed of the Alaska variety to the National Canners' Association for distribution among growers in various places in the States, and 400 pounds additional to a Michigan grower. The Alaska variety has the advantage, from the standpoint of the canner, of ripening all its seed at practically the same time. Another legume of much promise for the interior was the perennial vetch. *Trifolium lupinaster* proved to be hardy, produced seed freely, and never winterkilled.

Although grasses in great variety are native to Alaska, the stations, realizing that the production of feed is one of the most important agricultural problems in the interior, cultivated native species of grasses and forage plants and introduced from the States a number which on cultivated land in some regions yielded well enough to be profitable. At Rampart, Fairbanks, and Matanuska slender wheatgrass and smooth bromegrass were found to be valuable both for hay and pasture. At Matanuska Canadian bluegrass made a good stand when seeded with a mixture of bromegrass, slender wheatgrass, and alsike clover. Slender wheatgrass proved to be the most promising of all the introduced grasses at Copper Center.

Hay was successfully made from the native grasses wherever they grew in sufficient quantity and from grain sown for the purpose. The stations erected up-to-date silos and demonstrated that silage of good quality could be made from any kind of green forage. Silos are now to be found on the farms of all the more progressive farmers. Oats grown with peas or with vetches were found to make excellent silage. At Kodiak the native grasses were relied on for silage. Of the tame grasses, smooth bromegrass was best.

The stations demonstrated that turnips, carrots, sugar beets, rutabagas, mangel-wurzels, and Jerusalem-artichokes could be raised successfully to form an important part of rations for stock. The tops of the artichokes were excellent for silage making.

In 1898 the cattle in Alaska were mostly of Russian origin and showed deterioration not only in general conformation but also in milking qualities and in suitability for beef production. In 1906 the stations introduced the first Galloways into Alaska. These and later introductions of Galloways were kept at Kodiak. Occasionally a Galloway in the herd would produce an abundance of milk testing high in butterfat, but on the whole the breed was better adapted for beef than for milk. The Alaskan farmers needed milk as they did beef, and the stations therefore decided in 1916 to introduce the Holstein-Friesian breed for reciprocal crossing with the Galloways in the hope of establishing a type of cow combining the desirable characteristics of the Galloways with the milking qualities of the Holsteins.

The Galloway-Holstein hybrids were better in milk yield than the Galloways and the milk had a higher content of butterfat than had that of the Holsteins. Second-generation and third-generation hybrids yearly produced upwards of 13,000 pounds of milk yielding 400 to 600 pounds of butterfat. During the period 1907–1931 the herd of Galloways increased beyond the needs of the stations, and the surplus animals were sold to buyers at practically every rail and water shipping point in Alaska, and to some buyers in the Northwestern States. The Galloway breed is recommended as a beef breed for southwestern Alaska.

In 1920 the stations introduced milking Shorthorns into Matanuska, where conditions seemed to favor a dual-purpose breed of cattle that could be used for dairy and for beef purposes. In milk yield the cows were not so high as were either the Holsteins or the Galloway-Holstein hybrids, and they required more feed to keep them in thrifty condition. In 1920 a pair of milking Shorthorns was sent to the Fairbanks station. Prior to this introduction no purebred cattle had been brought to the Tanana Valley.

In 1925 the Holsteins and the Galloway-Holstein hybrids were transferred to Matanuska. Data on their behavior when they were kept under identical conditions indicated at least a favorable comparison of the hybrids with the two purebred breeds. The crossbreeds had in addition other qualities entitling them to consideration as foundation stock for the establishment of a dairy breed in Alaska.

In 1919, and again in 1923 and in 1930, the stations obtained from the Canadian Government nine yak for reciprocal crossing with Galloways for the production of a hardy type of bovine that could be used for meat, milk, and for domestic service. The hybrids, as indicated by size, were superior in vigor to full-blooded calves of about the same age. The animals were fine appearing, and it was hoped they could be used as the foundation stock for the development of a breed that would be especially well adapted to the pastures north of the Arctic Circle.

In 1910 the stations secured some Alaskan-born Cotswold and Shropshire grade ewes whose parents came from the Northwestern States. The flock was kept at Kodiak and was headed by one Lincoln and one Cotswold ram secured from Washington State. For 20 years the stations sold sheep to settlers living in various parts of

the southwestern insular and peninsular areas. In 1920 the stations introduced sheep into Matanuska where none had previously been kept.

The stations brought the Duroc-Jersey breed of hog to Fairbanks in 1914 and the Hampshire breed in 1920. Hog raising is now general among the farmers in the Tanana Valley. Demonstrations showed that pork can be produced profitably when the pigs are farrowed in February and March, are pastured on oats, peas, and rape, and fed an abundance of skim milk in summer, and are finished on oats, peas, and barley in a dry lot, or are allowed to hog off grain standing in the field.

In 1920 when tuberculosis decimated the dairy herds in interior Alaska, the stations introduced purebred Toggenburg goats of exceptionally good milking quality to assist in building up heavy-milking strains. There are now about 60 goats in the region, and the farmers find that 4 goats can be maintained on the feed that is required by 1 cow.

In 1928 experiments with the Rose-Comb Buff Leghorn variety of chicken were started at Matanuska. The flock of 50 hens and 4 cockerels were wintered in a small house without artificial heat and produced 396 dozen eggs from October 1, 1928, to September 30, 1930. Many years ago the stations introduced purebred Rhode Island Reds as a side issue at Sitka.

Prior to the introduction of purebred stock by the stations the majority of Alaskans desiring to purchase livestock were obliged to place their orders with breeders in the States. With the introduction of purebred livestock by the stations the work of upgrading the native stock was greatly encouraged.

In 1905 the stations unsuccessfully tried to raise bees in southwestern Alaska, and in 1927 introduced some at Matanuska. The bees were active in the fields during June, July, and a part of August, but the honey flow was poor. Some beekeeping within recent years has been done in the southern part of the Territory near the towns of Anchorage, Haines, and Wrangell.

In 1929 the stations wintered eight baby elk at Kalsin Bay for the Alaska Game Commission. Observations on the behavior of the animals indicated that they would thrive on Kodiak and the Afognak Islands.

In 1927 the stations, working in cooperation with the Alaska Railroad, began experimental work in a creamery at Curry. The stations supervised the work, and the railroad financed the undertaking and bought its cream from the farmers for making butter for use by its commissary. Thus, a market for dairy products was established for farmers at all points along the railroad.

In 1930 the stations, working in cooperation with the Native Industrial School of the United States Office of Education, began experimental work in dairying at Eklutna. The stations furnished the cattle, and the school fed and cared for them, furnished milking records to the stations, and received in exchange all the milk produced, for the school children.

In 1923 the stations made a survey of the homesteads located in the five leading agricultural districts of Alaska, that is, in the Tanana and the Matanuska Valleys, at Anchorage, at Kachemak Bay, and on Kodiak Island, and introduced into each district crops superior

to those grown, demonstrated the best methods of farm management, and gave advice concerning the erection of buildings and the purchase of livestock. In the Matanuska Valley cooperative grain growing under diversified conditions was undertaken with the farmers. Other investigations made by the stations were: In 1926 a survey of the dairy situation in Alaska; in July, 1928, a survey of the grazing possibilities of the Aleutian Islands and vicinity in order to be able to advise with and give suggestions to prospective cattle and sheep raisers; in August, 1928, a survey of the bunch-grass range at Healy and at Lignite on the north slope of the Alaska range; in May, 1929, a survey of the region at Dunbar to investigate the grazing possibilities there; in August, 1929, a survey of the agricultural possibilities of the Kusilof region; in September, 1929, a survey of the grazing region between Chiniak Point and Pashikshak Bay, Kodiak Island; in 1930, an agricultural survey of the Shearwater portage and Kiluda Bay regions, Kodiak Island; and in September, 1931, a survey of the Moose Pass region to investigate the grazing possibilities there.

Alaska has no prairie lands such as characterize the middle western part of the United States. Practically every foot of soil must be cleared before it can be put under cultivation. Only small areas have been cleared in the coast region because the cost of clearing is prohibitive. In the interior, especially in the Matanuska and the Fairbanks regions, the stand of trees is not so dense and clearing can be done at a comparatively reasonable cost. Two of the principal difficulties of the pioneer farmer were extending the cleared area and removing stumps from the fields. In the Matanuska Valley the main roots of the spruce and the birch trees are shallow and extend at nearly right angles to the trunks. The stations demonstrated that such trunks could best be removed with tractor power and devised a plan enabling the farmers to clear their lands quickly.

CHANGES IN PERSONNEL

Upon the transfer of the Fairbanks station to the Alaska Agricultural College and School of Mines May 1, 1931, and the closing of the Kodiak station June 30, 1931, the director of the Alaska agricultural experiment stations assumed charge of the investigational work at the Matanuska and the Sitka stations. Mabel Koenigs was appointed senior clerk and stenographer for the headquarters office, effective May 1, 1931. With the transfer of the Fairbanks station to the college, F. L. Higgins, formerly agronomist in charge of the station, was made agronomist of the Matanuska station. F. B. Linn, assistant animal husbandman of the Matanuska station, resigned September 1, 1931, to accept a position with the Alaska Agricultural College and School of Mines. J. C. Wingfield, who had been acting superintendent of the Matanuska station, was appointed superintendent of the station, effective July 1, 1931. E. A. Eggersgluess, horticulturist of the Sitka station since 1925, died March 27, 1931. Clifford Cordy was appointed April 16, 1931, to fill the vacancy caused by Mr. Eggersgluess's death. C. C. Georgeson, director of the Alaska stations since their inception in 1898 to the time of his retirement in 1928, died in Seattle, Wash., April 1, 1931.

COOPERATION WITH OTHER AGENCIES

Experimental creamery work was continued in cooperation with the Alaska Railroad Co. An additional number of farmers began shipping cream during the summer.

The cooperative experimental work in dairying, undertaken by the Alaska stations and the Office of Indian Affairs, Department of the Interior, was continued on the same basis as in 1930.

As in previous years the stations cooperated with the United States Weather Bureau in gathering information on amount of evaporation and wind velocity at the Fairbanks and the Matanuska stations. Instruments for measuring evaporation and for determining wind velocity were received from the Weather Bureau in 1929.

STATION EXHIBITS

The stations again participated in the annual agricultural fair held at Juneau. The Sitka station sent creditable exhibits of fruits and vegetables to the fair, and the Matanuska station sent seven sheaf samples and five samples of threshed grain to the Paris Colonial Exposition.

STUDIES OF BLUEBERRIES

An experiment was begun to learn whether blueberries can be produced commercially in Alaska. A number of plants of cultivated varieties of blueberries (*Vaccinium corymbosum*), obtained from Whitesbog, N. J., were planted at the Matanuska and the Sitka stations. Plants of a strain of the native bog blueberry (*V. uliginosum*), which bears large fruits, were obtained from the region near Two Lakes, about 150 miles west of Anchorage, and planted at the Matanuska station for use as foundation stock for breeding experiments.

SITKA STATION

REPORT OF THE HORTICULTURIST

By C. Cordy

Weather conditions during the summer of 1931 were generally favorable for plant growth. Vegetables were planted April 25. Severe frost did not occur until October 15, when it killed potato tops and injured other young growth.

DISTRIBUTION OF NURSERY STOCK

Distribution of nursery stock for trial to residents throughout the Territory included fruit plants, ornamental shrubs, and seed potatoes. Many cuttings were made from ornamental shrubs to increase the supply of plants at the station and to allow for their distribution in the future.

THE ORCHARD

During the year a hybrid apple tree resulting from crossing the native crab (*Malus rivularis*) with Keswick (Keswick Codlin) bore

fruit. (Fig. 1.) The fruits were intermediate in size between those of the two parents and grew in clusters like the apples of the native species. One tree of Keswick yielded 75 pounds of medium-sized, scab-free fruit. Experiments with the other fruit trees confirmed those of previous years. Cherry trees bore only a small crop of fruit,

FIGURE 1.—Apples: A, Native crab; B, hybrid; C, Keswick

which, however, was of good quality. Plum trees matured fruits, but some of them cracked badly and were inedible. None of the plums has proved to be early enough for Sitka conditions. Pear trees set only two fruits, neither of which matured. The peach and the apricot trees again failed to bear fruit.

SMALL FRUITS

Four plants each of a number of varieties of small fruits, including gooseberries, currants, and red raspberries, were transplanted to a permanent plat to test their relative merits and to serve as a source for propagating material. The plants bore practically no fruit this year, probably because they were transplanted too late in the season. Logan blackberries, blackcap raspberries, and thimbleberries were also transplanted. Ten plants each of 143 varieties of hybrid strawberries, representing the best strains from a large number of hybrids developed at the station, were transplanted late in the season to an area of compact soil for the purpose of propagating them and of observing their behavior under unfavorable conditions.

VEGETABLES

Most of the vegetables, especially cabbage, did well this season. Brussels sprouts headed rather late in the season, and some of the plants had a tendency to be leafy, but they matured. Green onions were available all summer; no large bulbs matured. The other

vegetables grown were cauliflower, peas, parsnips, kale, lettuce, beets, carrots, radishes, kohlrabi, spinach, turnips, parsley, and Swiss chard.

POTATOES

Five hills each of 27 commercial varieties and 72 seedling strains of potatoes were planted during the spring. Most of the varieties produced good crops of medium-sized tubers. Ten seedlings, originating at the station, led in yield. No. 1471 gave the highest yield and was followed by Nos. 1474, 1441, and 1421, in the order named. Green Mountain, Pride of Multnomah, Rural New Yorker, Snowball, and Junior Pride were the leading commercial varieties, in the order named. The crop was planted April 27 and dug November 22.

WEED ERADICATION

Experimental work was continued to determine the best methods of exterminating weeds in southeastern Alaska. Chickweed (*Alsine media*) and buttercup (*Ranunculus repens*) were the most difficult to control. The Canada thistle (*Cirsium arvense*) made scattered growth. It was dug out weekly, and only a few of the plants survived. Another season of similar weekly treatment should eradicate them.

LAWNGRASSES

Rough bluegrass (*Poa trivialis*), Kentucky bluegrass (*P. pratensis*), English ryegrass (*Lolium perenne*), Astoria bent (a horticultural variety of *Agrostis tenuis*), redtop (*A. alba*), and red fescue (*Festuca rubra*) were planted April 23 in the orchard to determine their value as lawngrasses and as cover crops. Red fescue and redtop proved to be best for most conditions. Kentucky bluegrass and creeping bent grew poorly in poor soil, but produced excellent stands when the plats were fertilized. The ryegrass started early and grew well, but it is too coarse for use as a lawngrass. Redtop and German mixed bent (*Agrostis* sp.) made a fine stand when fertilized with tankage. For poor soils the ryegrass proved to be the best cover crop, producing much more growth than did any of the other grasses. All the grasses on fertilized plats did well. Redtop was slightly the superior in growth.

Fertilizers were applied to several grass plats to observe the effect. Freshly hydrated lime, applied in April at the rate of 8 tons per acre, had no beneficial effect, the grass on the limed plat making no better growth than that on the check plat. The growth of grass was greatly stimulated by applications, at the rate of 5 tons per acre, of tankage containing 6 per cent of available nitrogen and 10 per cent of available phosphorus. The fertilized grass was cut several times, whereas the grass on the check plat was not cut.

EFFECT OF FERTILIZERS ON GRAPEVINES

An application of 2 pounds of superphosphate (18 per cent) to two grapevines, one of which was pinched back during the summer, caused the tissues to harden markedly. The untreated grapevine was badly frostbitten by September 17, whereas the treated vines were still in fine condition. The wood of the vine that was both fertilized and pinched back was alive, although frostbitten, by

November 15. The other plants were killed to the ground. Grapevines when treated with muriate of potash proved to be slightly more hardy than the check plant but succumbed to frost shortly after the latter.

FLOWERING PLANTS

The many flowering plants on the station grounds bloomed profusely and continuously from April 15 to November 1. Eighty new herbaceous perennials were introduced and planted in a solid block to determine their adaptability to this part of the country. Some of the plants were in poor condition when they arrived, but 67 grew satisfactorily and many of them bloomed heavily.

MATANUSKA STATION

REPORT OF THE SUPERINTENDENT

By J. C. Wingfield

WEATHER CONDITIONS

Weather conditions at Matanuska were fairly favorable for farming during the first nine months of 1931. The precipitation from January 1 to September 30 was 10.46 inches, or slightly less than average for the same months during the 10-year period 1919–1928. The rainfall during April was only 0.22 inch, but during May it was 2.31 inches, which proved to be ample for crop growth.

FIELD CROPS

Grain crops.—The general field crops were planted on fall-plowed land. Comparatively little rain fell in the spring, and it was thus possible to begin work in the fields 10 days earlier than was done the previous year. Grains were seeded from May 13 to May 20. Planting was begun 8 days earlier than in 1930, and 14 days earlier than in 1929. Each seed bed was "cultipacked" to prevent soil erosion.

Trapmar barley was sown on 6 acres after the seed had been tested for germination and treated with copper carbonate for smut control. The seed gave a lower germination than did that used in 1930. The amount sown in 1931 was at the acre rate of 90 pounds as compared with 80 pounds in 1930. Emerging May 25, 12 days after it was planted, the crop grew slowly until early June when growth became vigorous. The grain was fully headed by July 12, harvested August 26, and yielded at the acre rate of 18 bushels.

Prior to being sown, the seed of Siberian No. 1 wheat was tested for germination and treated with copper carbonate for smut control. Seeded May 13 at the acre rate of 100 pounds, the crop emerged May 28, three days later than the barley, and grew vigorously for about four weeks. Favorable weather caused the grain to grow well during the later part of the summer and to ripen uniformly. The crop yielded at the acre rate of 28 bushels.

Shadeland Climax oats were seeded at the acre rate of 90 pounds on a 1-acre plat adjoining the barley and the wheat. Prior to being sown, the oats were treated with a proprietary compound to control

smut. The crop was headed by July 15, harvested September 8, and yielded at the acre rate of 54 bushels.

Forage crops.—Oats and peas for silage, and oats and vetch for hay were seeded June 6 and June 7, respectively, on fall-plowed land that had previously been double-disked and harrowed. Immediately after seeding was done the areas were cultipacked.

Oats and Canadian peas were planted for silage in the acre ratio of 90 pounds of oats to 40 pounds of peas on 22¼ acres. The first seeding for silage was made June 6, and the last, June 23. Planted on land that had just been harrowed, the crop emerged June 12, grew rapidly, and soon shaded the ground, thus killing weed growth. The oats and peas were cut one way with a mower, raked into windrows, and loaded from them. Cutting was started September 9 and completed September 14. The cost of harvesting 181 tons of silage, at the rate of $1.87 per ton, was $338.47. The silos were filled without the material being tramped down. The green oats were used to seal the top of the silage. The yield was at the acre rate of 8.5 tons.

A mixture of oats and vetch was seeded for hay. Part of the resulting crop was cut with a binder. The rest was cut with a mower to determine the most economical method of harvesting. The bundles of forage were found to be difficult to cure. Cutting the crop with a mower and curing it in cocks was the more economical of the two methods.

Potatoes.—The potato varieties tested were White Triumph (White Bliss) Russet Burbank (Netted Gem), Early Ohio, and Irish Cobbler. All the potatoes were given an antiscab treatment and were green-sprouted. White Triumph was planted May 26, and the three other varieties May 27. All varieties had emerged by June 27. The potatoes were not all dug at the same time as has been the custom. Part of each variety was dug September 14, and the rest September 25 to determine the differences in yield and the differences in stages of maturity of early and late digging. White Triumph, dug September 25, outyielded by 478 pounds the same variety dug September 14. Six rows of Irish Cobbler were dug September 14 and five rows September 25. The potatoes from the six rows averaged 246 pounds in weight, as compared with 283 pounds from the five rows, which was an average gain of 37 pounds in favor of delayed digging. Early Ohio, dug from two rows September 25, showed a gain of 19 pounds over the yield obtained from a similar area September 14. All the potatoes dug September 25 were more mature than those dug September 14. The skin did not feather and tear as easily as did that of tubers dug 11 days earlier.

The yield of potatoes left in the ground under favorable conditions seemingly should show some increase over that of potatoes dug earlier. Early Ohio on a 0.09-acre plat yielded at the acre rate of 6.25 tons, White Triumph on a 0.94-acre plat at the acre rate of 5.1 tons, Irish Cobbler on a 0.31-acre plat at the acre rate of 4.66 tons, and Russet Burbank on 1.18 acres at the acre rate of 4.1 tons. Table 2 records the average gain in yield per row of each variety during the 11-day period.

TABLE 2.—*Record of average gain in yield per row of four varieties of potatoes during the 11-day period September 14–25 at the Matanuska station*

Variety	Number of rows dug	Date of digging	Yield	Average yield per row	Average gain in yield per row from delayed digging
			Pounds	*Pounds*	*Pounds*
White Triumph	16	Sept. 14	4,549	284.3	38.0
	16	Sept. 25	5,157	322.3	
Russet Burbank	21	Sept. 14	4,603	219.1	22.8
	21	Sept. 25	5,081	241.9	
Irish Cobbler	6	Sept. 14	1,476	246.0	36.8
	6	Sept. 25	1,414	282.8	
Early Ohio	2	Sept. 14	553	276.0	9.5
	2	Sept. 25	572	286.0	

Root crops.—Of the root crops under test, carrots were the first, and rutabagas the second, to be planted. The carrots grew vigorously and developed roots of good size. The rutabagas were comparatively small. Both crops were harvested during early October. Carrots on an 0.18-acre plat yielded at the acre rate of 5.9 tons, and rutabagas on a 0.75-acre plat yielded at the acre rate of 8 tons. Mangels were planted on poor land and made low yields.

HORTICULTURAL CROPS

The winter of 1930–31 was severe on young nursery stock. The formation of an ice sheet over the ground and the expansion and contraction caused by extremes of temperature in January, February, and March are believed to have been the cause of the killing of a large percentage of the plants. Strong winds during these months caused heavy snowdrifts in places.

Apples.—The crab apple appeared to be the hardiest of the tree fruits tested. Several varieties did well. One tree of Red Siberian crab which was planted in the spring of 1929, had 46 clusters of blossoms. (Fig. 2.) A number of the clusters set fruit, but many of the smaller fruits dropped during the summer. Hibernal and Anoka appeared to be the hardiest of the apple trees, although they were less hardy than some of the crab-apple trees.

Small fruits.—Currants were the hardiest of the bush fruits tested at the station. Holland (Long-bunch Holland) was the most desirable of the red varieties, and White Grape the most desirable of the white varieties.

Red raspberries were next in order of hardiness of the bush fruits. Cuthbert was the leading variety of red raspberry. Blackcap varieties were not grown successfully.

Twenty-five blueberry plants were planted in the spring of 1930. A few survived the winter, but made poor growth in the summer. Blueberry plants will hardly withstand the rigors of winter at Matanuska.

The native strawberry (*Fragaria platypetala*) survived the winter in fine condition. Of the hybrid varieties sent from the Sitka station, only three came through the winter. Hybrids Nos. 321 and 1449 were the hardiest of those surviving.

Grapes.—Grapes tested at the station, including the varieties Clinton, Alpha, and Beta, either winterkilled the first winter, or failed to live through the following growing season.

Herbaceous perennials.—More than 100 different species of herbaceous perennials were planted, but comparatively few bloomed.

Lawngrasses.—Seed of the varieties creeping bent (*Agrostis palustris*),

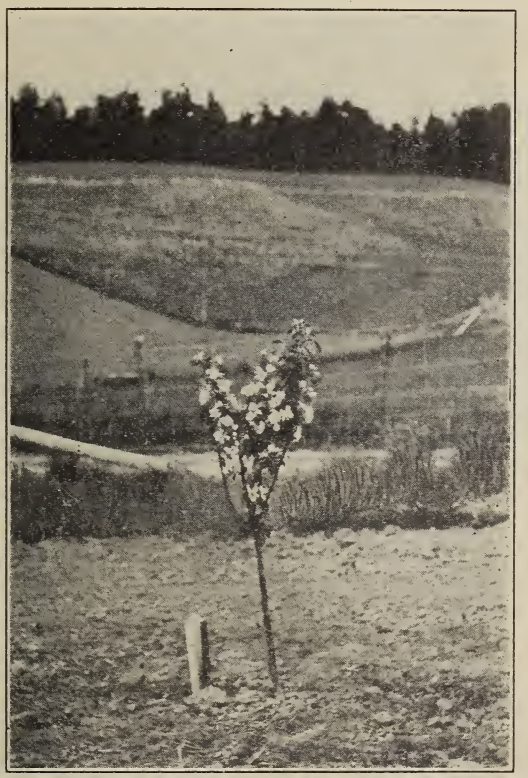

FIGURE 2.—Red Siberian crab-apple tree, Matanuska station, June, 1931

colonial bent (*A. tenuis*), seaside bent grass (*A. palustris*), red fescue (*Festuca rubra*), Chewings fescue (a horticultural variety of *Festuca rubra*), creeping fescue (a horticultural variety of *F. rubra*), sheep fescue (*F. ovina*), shade fescue (*F. heterophylla*), hard fescue (*F.) duriuscula*), Kentucky bluegrass (*Poa pratensis*), Canada bluegrass (*P. compressa*), wood bluegrass (*P. nemoralis*), alsike clover (*Trifolium hybridium*), and white clover (*T. repens*) was sown August 8 in plats each 10 feet square. (Fig. 3.) All the resulting seedlings emerged within 10 days except the hard fescue which did not emerge for 19 days, and the shade fescues which failed to grow. Creeping red fescue made the most promising growth in the fall in 1930.

Plant introductions.—In the spring of 1931 the plant introductions included 23 apple trees, 37 crab-apple trees, 76 plum trees, 10 cherry trees, 2 pear trees, 33 currant plants, 22 raspberry plants, 18 gooseberry plants, 2 blackberry plants, 10 grapevines, 45 ornamental shrubs, and 126 herbaceous perennials.

Orchard management.—To suppress weed growth the spaces between the rows of trees were disked and harrowed several times during the summer. A mixture of oats and vetch was seeded between the rows in July to hold the snow in winter and to prevent erosion of the soil by strong winds during the winter and the spring.

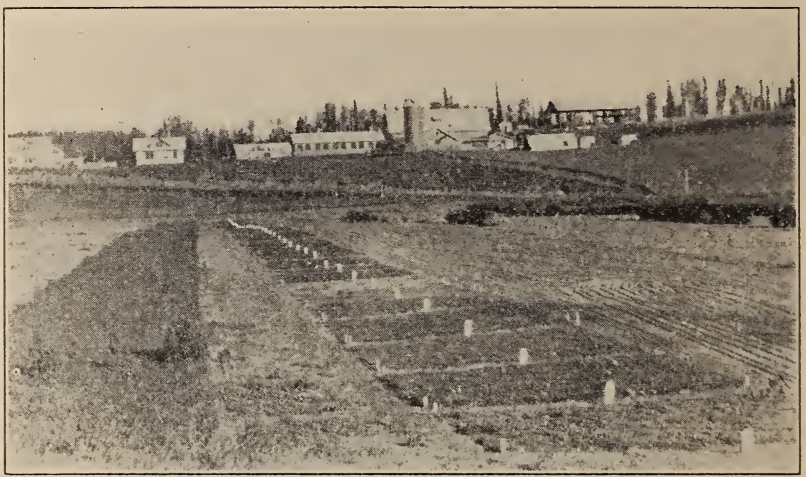

FIGURE 3.—Two series of 19 grass plats, nursery field, Matanuska station, planted August, 1931

STATION IMPROVEMENTS

During the winter of 1930–31, 41 acres of timberland was slashed. Slashing was done on contract, and the cost of both slashing and clearing varied with the nature of the field. A tractor-drawn 1,800

FIGURE 4.—Combination plow and tractor, which has reduced the cost of breaking virgin land from one-seventh to one-fifth of the price paid under old methods

pound 22-inch brush plow was used on the cleared areas. (Fig 4.) One and one-half acres east of the barn was also cleared this season. The area had previously been slashed.

A well 3⅓ feet in diameter and 32 feet deep was dug and lined with concrete tile. This well is on the second bench at the foot of the hill on the west side of the road, northwest of the station buildings.

The station obtained, either through purchase or through transfer from the Kodiak and the Fairbanks stations, a grain drill, a threshing machine, a heavy traction plow, a truck wagon, a potato grader, a potato planter, a potato digger, and laboratory equipment.

A hog barn was completed at the Matanuska station during the summer. It contains eight pens, each 6 by 8 feet, and is equipped with metal sanitary troughs and floor drainage. A steam boiler was installed in the basement to permit of quickly cooking feeds for the hogs, and pipes were laid to carry heat to the farrowing pens in February and in March.

REPORT OF THE AGRONOMIST

By F. L. Higgins

FORAGE CROPS

Several strains of alfalfa and clover were planted in duplicate plats in July, 1930, to determine their winter hardiness. Although the varieties were well established by fall and were growing vigorously, they failed to survive the winter of 1930–31. A strain of Arctic sweetclover, obtained from the University of Saskatchewan, Canada, and planted June 19, 1931, made heavy growth during the first season and went into the winter in good condition.

Experiments were begun to determine the moisture content of green oats and vetch for hay when cut with a mower and with a grain binder. Samples cut with a mower August 20 and left to cure in a swath in the field had a moisture content of 75.8 per cent. Seven days later this had decreased to 45.5 per cent. After remaining for 15 days in the barn the material had a moisture content of 23.9 per cent. Oats and vetch, cut with a binder August 20, were allowed to cure in the field and then were placed in the barn. The forage in bundles had a moisture content of 33 per cent September 11.

Oats and peas were cut for silage September 11 when the oats were in the hard dough stage and the pea pods were well filled. The freshly cut material had a moisture content of 71.2 per cent. The moisture content of the green oat plants was 65.1 per cent; that of the pea plants was 76.2 per cent.

A similar test was made with oats and vetch. The crops were harvested September 11, just after the oats had passed the bloom stage, and while the vetch was in full bloom. The freshly cut material had a moisture content of 74.1 per cent. The moisture content of the green oat plants and of the green vetch plants was 71.3 and 79.5 per cent, respectively.

CEREAL CROPS

Five varieties of spring wheat, 6 varieties of barley, and 4 varieties of oats were sown May 20 in plats of 3 rod rows each for comparison of earliness and yield. Of the wheat varieties Siberian No. 1 yielded at the acre rate of 20 bushels; Ruby, 26 bushels; Garnet, 36 bushels; Hybrid No. 63, 37 bushels; and Marchosser, 23 bushels. Of the barley varieties Trapmar yielded at the acre rate of 32 bushels; Hybrid No. 68d, 27 bushels; Hybrid No. 68e, 32 bushels; Hansen, 38 bushels;

Manchuria, 35 bushels; and Hybrid No. 28, 32 bushels. Of the oat varieties, Canadian yielded at the acre rate of 63 bushels; Shadeland Climax, 67 bushels; Abundance, 49 bushels; and Leader, 53 bushels. Hogot winter rye was planted at weekly intervals during the season of 1930. The first planting was made May 28, and the last September 3. The plantings made between July 16 and August 21 gave the highest yields.

PEAS FOR CANNING

Peas for canning on $\frac{1}{80}$-acre plats yielded at the acre rate of 1,880 pounds. The peas were shelled by hand. Peas were also grown in plats of 3 rod rows each to determine the optimum date for planting them for canning. The peas were considered to be at the canning stage when the pods were well filled but were still young and tender. At this stage the pods change from dark green to light green. Peas planted May 19 and May 23, respectively, matured seed. Because of the rapid growth of weeds, peas for canning should not be planted too early. The first 10 days of June were found to be the most desirable for planting. Planted later, the peas may not reach the canning stage, in an unfavorable season.

POTATOES

On well-fertilized soil 13 varieties of potatoes produced good yields, indicating that climatic and soil conditions are favorable to the potato. Irish Cobbler yielded at the acre rate of 354 bushels, White Triumph (White Bliss), 391 bushels; Etta, 384 bushels; White Rose, 342 bushels; Early Ohio, 387 bushels; Burpee Superior, 412 bushels; Russet Burbank (Netted Gem), 375 bushels; Jean, 411 bushels; Triumph (Bliss Triumph), 378 bushels; Eureka, 347 bushels; Ohio Junior, 390 bushels; American Wonder, 372 bushels; and June, 351 bushels.

BEETS, TURNIPS, AND OTHER ROOT CROPS

Eight varieties of stock beets, 1 variety of sugar beet, 2 varieties of stock carrots, and 1 variety of rutabaga were grown in adjacent fertilized plats to determine those best suited to the region. All the crops were harvested September 24. Of the stock beets Mammoth Long yielded at the acre rate of 8.4 tons, Sludstrup, 11.7 tons; Gatepost, 13.1 tons; Golden Tankard, 11.3 tons; Giant Half Sugar, 9.4 tons; Heavy Cropper, 12.7 tons; Yellow Giant, 12 tons; and Giant Red Eckendorf, 12 tons. The sugar beets yielded at the acre rate of 6.2 tons. Of the stock carrots Improved Long Orange yielded at the acre rate of 6.2 tons, and White Belgian, 8.3 tons. Petrowski turnips yielded at the acre rate of 22 tons, and American Purple Top, 20.8 tons.

ROTATION PLATS

Three series of crop-rotation plats were under study. The land is low in fertility, and the unfertilized plats showed a pronounced border effect.

CROP INTRODUCTIONS

The seed of 13 strains of flax was obtained from the Bureau of Plant Industry, United States Department of Agriculture, for trial under Matanuska conditions. The varieties Rio (C. I. 280) [1], Redwing

[1] Accession number of the Division of Cereal Crops and Diseases, Bureau of Plant Industry.

(C. I. 320), Linota (C. I. 244), and Bison (C. I. 389), were planted May 25, and Saginaw (C. I. 449), Bateson (C. I. 373), Tammes Light Blue (C. I. 332), Ottawa White Flowered (C. I. 24), and C. I. Nos. 401, 421, and 448, June 2. Tammes Light Blue was mature by September 23. Bateson, Saginaw, Redwing, Linota, and C. I. Nos. 401 and 488 were mature by September 30. The other strains failed to mature.

A strain of early maturing corn was obtained from Poland and planted at the station. The plants tasseled August 18 and produced silks August 22. A crop was not produced.

Seed of Vilno soybeans germinated slowly. The plants when 12 inches high were killed by frost.

Perfection peas for canning, received from Wisconsin, made satisfactory growth and reached the canning stage by August 29. Perfection does not mature so early as the Alaska variety.

WEED ERADICATION

In order to determine the value of calcium chlorate for eradicating quack grass (*Agropyron repens*), the perennial weed of greatest economic importance in the Matanuska region, that herbicide, both in solution and as a dust, was applied to square-rod plats in severely infested fields at monthly intervals from June until October.

SOIL STUDIES

Investigations on temperature, moisture content, acidity, depth, mechanical analysis, and rate of deposition of soils were continued. A preliminary experiment was begun to determine the rate and amount of soil annually deposited per unit area.

REPORT OF THE ANIMAL HUSBANDMAN

By W. T. White

CATTLE

During the winter of 1930–31 the Matanuska station maintained 12 Holsteins and 27 hybrid Galloway-Holsteins, including 1 Holstein and 1 hybrid herd bull. In the spring of 1931 the station sold 3 cows, 4 heifers, and 1 bull calf—all Holsteins. In November, 1931, the Holstein herd numbered 3 cows, 1 bull, and 1 bull calf; the hybrid Galloway-Holsteins numbered 14 cows in milk, seven 3-year-old heifers, 6 yearling heifers, 4 heifer calves, 4 bull calves, and 2 herd bulls; and the Galloways numbered 2 cows and 1 bull calf.

Dry cows and heifers were wintered on oats, pea silage, and oat straw, supplemented during March and April with 2 pounds of mangels and 1 pound of grain. Beginning April 1 the cattle were placed on pasture during the day but were fed in the barn at night. They were not able to graze their fill of forage until late May. Beginning May 23 the heifers and the dry cows were ranged in the open day and night. The cows maintained a satisfactory flow of milk on rations composed of oat and pea silage, oat and vetch hay, and a mixture of ground barley, ground oats, and linseed meal. Table 3 gives a comparison in yield of milk and butterfat of five Holsteins and nine Galloway-Holstein cows at the Matanuska station in 1931.

TABLE 3.—*Record of production of five Holstein and nine Galloway-Holstein cows during one lactation period at the Matanuska station, 1931*

Breed and cow No.	Lactation period	Total milk yield	Daily average milk production	Butterfat
Holstein:	*Days*	*Pounds*	*Pounds*	*Per cent*
23	365	13,748	37.7	3.4
24	319	8,871	27.8	3.3
26	365	10,154	27.8	3.3
28	290	8,741	30.1	3.8
29	358	7,660	21.4	3.4
Galloway-Holstein:				
16	365	13,247	36.3	3.5
39	365	6,860	18.8	3.8
41	365	13,169	36.1	3.9
42	351	12,617	35.9	4.2
44	365	8,149	22.3	4.2
45	365	8,621	23.6	4.7
62	333	7,323	22.0	4.1
65	365	9,088	24.9	3.9
67	365	10,535	28.9	4.1

Two Holstein cows, Nos. 23 and 28, were better than average both in daily average milk yield and in butterfat production. All the hybrid cows were above average in butterfat production. Hybrid cows Nos. 41 and 42 produced more than 500 pounds of butterfat. Cow No. 42 produced the largest total amount of butterfat, although she was milked during only 351 days, which was 14 days less than the full lactation period.

Table 4 gives a summary of the cost of feeding nine hybrid cows at the Matanuska station during the fiscal year ended June 30, 1931.

TABLE 4.—*Cost of feeding nine hybrid cows at the Matanuska station, fiscal year ended June 30, 1931*

Expenditures		Receipts	
Item	Amount	Product	Amount
Silage (32.5 tons at $6.42 per ton) [1]	$208.65	Butterfat [2]	$200.10
Hay (10 tons at $40 per ton) [2]	400.00	Skim milk [3]	44.80
Grain (10.5 tons at $60 per ton) [2]	630.00	Calf	10.00
Linseed meal (1.8 tons at $100 per ton) [2]	180.00		
Salt and medicine (at about $10 per cow)	90.00	Average income per cow	254.90
Pasture (at about $10 per cow)	90.00	Average cost per cow	177.62
Total cost	1,598.65	Average gain per cow	77.28
Average cost	177.62		

[1] Cost of production at the station.
[2] Local market value.
[3] Valued at one-half cent a pound, after deducting 10 per cent for loss in separating from cream.

The summary in Table 4 indicates that the Matanuska farmer may not only realize satisfactory returns from his dairy cows but, since he grows all their feed, including roughage and grain, may thus also market the feeds at good prices.

HOGS

Three brood sows and a boar of the Hampshire breed were wintered at the station. One of the sows developed lameness similar to that

previously reported [2] and was fed daily 1 ounce of cod-liver oil in the slops and one-fourth pound of linseed meal in the grain ration. She slowly partly recovered and farrowed a litter of 13 fine pigs, of which 11 lived. The sow completely recovered after she was turned on an oat-pea-rape pasture early in July.

Two gilts of the Hampshire breed were purchased from a breeder in Idaho during the fall of 1930. They farrowed in June and raised 20 pigs. The sows with their pigs were turned out to pasture on oats, peas, and rape from July 1 to October 15. The pigs were fed skim milk and grain, and the sows grain and slops as a supplement to the pasture. The pigs farrowed in June had an average weight of 107 pounds per head October 15.

SHEEP

Fourteen ewes and a ram were wintered at Curry. The animals were housed at night to protect them from dogs and from other animals but were allowed to range during the day. The sheep were fed a winter ration composed of oat hay and wheat straw. Twelve of 16 lambs dropped during the year lived.

YAK

The station yak and yak-Galloway hybrids were wintered on the grasslands on the north slope of the Alaska Range of Mountains west of the Nenana River, in the vicinity of the Lignite railroad station. The herd numbered six yak and seven hybrids November 1, 1931.

An 8-year-old hybrid yak cow that proved to be a nonbreeder was slaughtered September 24, 1931. Post-mortem examination showed that one of the ovaries had never developed, and that the other contained a fair-sized cyst. The cow had a body weight of 1,260 pounds. The dressed weight was 52 per cent after the head, hide, feet, and offal were removed. Various cuts of the carcass were sent to persons desiring to learn how it compared with beef for table use, and some of the meat was also served at the station. The meat was coarse-grained, red, and had an odor much like that of bison meat. The fat was yellow. Roasted or used in stews the meat was similar to beef in taste. Prepared as steak, however, the yak meat required proportionately much more cooking than did corresponding beef cuts.

SILAGE

Sliced potatoes and freshly cut hay, consisting of approximately one-third part by weight of oats and two-thirds part by weight of peas, were alternately arranged in layers and stacked to determine the keeping quality of the material. After being allowed to stand for two months the material was fed. The results indicated that this silage is not so palatable, nor can it be produced as economically, as that made from peas and oats. Potatoes can be fed more economically in the raw state than in the form of silage.

MOSQUITOES

During the summer an experiment was begun to learn the relative value of certain mosquito repellents for use when cattle are in pasture. Two sheds, each 20 by 40 feet, were erected in one of the pastures.

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[2] ALBERTS, H. W. REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS. Alaska Agr. Expt. Stas. Rpt. 1929, 58 p., illus.

Smoke from smudges in the open is to be introduced into one of the sheds. In the second shed the rafters are to be overhung with burlap saturated with a mosquito repellent. The burlap is to be arranged to brush against the cattle. It is hoped to determine in this way the desirability and the cost of erecting similar sheds in the various pastures in order that the cattle may find relief by seeking shelter in them at will.

FAIRBANKS STATION

REPORT OF THE AGRONOMIST

By F. L. Higgins

WEATHER CONDITIONS

The winter was exceptionally mild, very little cold weather occurred, and the total snowfall was 43.6 inches. By May 1 all the snow had disappeared, and the soil was drying rapidly.

COMPOSITION OF SOME LOCALLY GROWN FORAGE CROPS

During the summer of 1929 samples of the native cotton-sedge (*Eriophorum vaginatum*), the native bluetop grass (*Calamagrostis* sp.), and the native sedge (*Carex aquatilis*) were harvested at different stages of growth. The first samples were cut July 22, and thereafter at weekly intervals until November 4. Samples of bird vetch (*Vicia cracca*), yellow-flowered alfalfa (*Medicago falcata*), and bromegrass (*Bromus inermis*) were cut July 19. All samples were air-dried, and analyzed for feeding-stuffs data. The Bureau of Chemistry and Soils, United States Department of Agriculture, made the determinations. The cooperation of the bureau in this undertaking is gratefully acknowledged. Table 5 gives a description of the samples and the results of the analyses.

Table 5.—*Analyses of some locally grown forage crops, cut weekly, at the Fairbanks station*

Crop and sample No.	Date of harvesting	Height of plants	Description of sample	Water	Fat	Crude fiber	Protein (N×6.25)	Ash	Nitrogen-free extract
Cotton-sedge:		*In.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
532	July 22	10	Leaves, green, succulent	5.94	1.90	31.96	9.63	2.93	1.54
533	July 29	15	do	5.52	1.59	31.45	9.19	2.17	1.47
534	Aug. 5	18	do	5.90	1.44	33.28	10.19	2.57	1.64
535	Aug. 12	18	do	5.62	1.38	32.30	9.81	2.48	1.57
536	Aug. 19	18	Few lower leaves yellowing	5.77	1.50	29.89	8.88	2.51	1.42
537	Aug. 26	18	10 per cent of leaves yellow	5.98	1.86	27.77	8.75	2.50	1.40
538	Sept. 2	18	Beginning to head; tips of leaves drying.	6.00	2.01	32.85	6.62	2.11	1.06
539	Sept. 9	18	Heading; leaf tips dead	5.44	2.01	34.85	5.63	1.80	.90
540	Sept. 16	18	Upper third of leaves dead; half of lower leaves yellow.	5.55	1.89	32.24	5.44	2.03	.87
541	Sept. 23	18	do	5.48	1.92	33.38	4.63	1.72	.74
542	Sept. 30	18	Seed ripe	5.64	1.91	35.30	4.88	1.63	.78
543	Oct. 7	18	Seed beginning to shatter	5.55	1.92	33.45	5.75	1.90	.92
544	Oct. 14	18	do	5.80	1.68	33.07	3.25	1.68	.52
545	Oct. 21	18	About 90 per cent of leaves dead	5.85	1.77	33.44	4.00	1.97	.64
546	Oct. 28	18	Plant brown and dead except for few basal leaves.	5.86	1.76	33.88	4.19	1.91	.67
547	Nov. 4	18	do	5.69	1.54	34.63	4.00	1.79	.64

TABLE 5.—*Analyses of some locally grown forage crops, cut weekly, at the Fairbanks station*—Continued

Crop and sample No.	Date of harvesting	Height of plants	Description of sample	Water	Fat	Crude fiber	Protein (N×6.25)	Ash	Nitrogen-free extract
		In.		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Bluetop:									
515	July 22	42	Just past full bloom; seeds forming	5.33	1.78	32.85	8.88	4.47	1.42
516	July 29	42	Seed ripe	5.13	1.74	31.51	10.69	4.41	1.71
517	Aug. 5	42	Seed ripe, partly shattered	4.94	1.74	32.37	11.50	6.01	1.84
518	Aug. 12	42	do	4.86	1.85	33.13	4.88	7.24	.78
519	Aug. 19	42	Few lower leaves yellowing	5.04	1.33	36.51	6.25	5.09	1.00
520	Aug. 26	42	Most seed shattered; panicles dry; lower leaves dead.	4.95	1.67	34.73	4.63	6.98	.74
521	Sept. 2	42	About half of leaves dead; culms green.	4.77	1.69	35.51	3.50	6.60	0.56
522	Sept. 9	42	About 90 per cent of leaves dead; culms green.	4.81	1.72	36.98	5.06	6.53	.81
523	Sept. 16	42	Culms discoloring	5.05	1.66	39.22	3.50	5.40	.56
524	Sept. 23	42	do	5.37	1.59	34.85	5.06	7.35	.81
525	Sept. 30	42	Culms, leaves, panicles, dead; dry; nodes discoloring.	5.07	1.42	38.21	4.63	4.20	.74
526	Oct. 7	42	Plant dead, dry; leaves intact	4.58	1.52	40.90	4.69	4.41	.75
527	Oct. 14	42	do	4.46	1.56	40.99	2.63	6.51	.43
528	Oct. 21	42	do	4.70	1.60	38.02	2.13	6.64	.34
529	Oct. 28	42	do	4.80	1.49	40.61	2.25	6.34	.36
530	Nov. 4	42	do	4.81	1.62	41.57	2.25	6.77	.36
Sedge:									
500	July 22	24	Just preceding heading	5.26	1.79	28.95	11.00	4.36	1.76
501	July 29	36	Heading	5.41	1.74	32.71	8.19	4.72	1.31
502	Aug. 5	36	Seed developed	5.38	1.51	30.70	12.25	4.66	1.96
503	Aug. 12	36	Some seeds ripe	4.98	2.17	30.00	10.88	4.34	1.74
504	Aug. 19	36	Few leaves yellowing	4.98	1.88	29.32	9.81	4.38	1.57
505	Aug. 26	36	Seed ripe; about 25 per cent of leaves yellow.	4.85	2.02	25.55	8.25	4.78	1.32
506	Sept. 2	36	Tips of leaves drying	5.08	2.56	34.59	7.81	4.49	1.25
507	Sept. 9	36	Seed ripe, beginning to shatter; upper leaves dead.	4.96	1.45	34.30	8.69	5.32	1.39
508	Sept. 16	36	Practically all seed shattered; 25 per cent of lower leaves dead.	4.85	1.48	32.86	8.00	4.75	1.28
509	Sept. 23	36	do	5.62	1.53	32.66	5.87	4.58	.94
510	Sept. 30	36	do	5.18	1.34	34.12	5.69	4.66	.91
511	Oct. 7	36	do	5.54	1.56	35.87	6.31	5.58	1.01
512	Oct. 14	36	do	5.38	1.60	34.19	5.78	5.20	.93
513	Oct. 21	36	Plant dead; leaves intact	5.24	2.18	35.87	3.68	3.36	.59
514	Oct. 28	36	do	4.78	2.13	36.89	3.89	3.22	.62
531	Nov. 4	36	do	4.84	2.00	35.66	3.69	2.91	.59
Bird vetch:									
548	July 19	48	Full bloom	6.60	1.40	35.54	10.69	6.65	1.71
Alfalfa:									
549	do	20	do	6.72	1.34	32.96	16.50	7.22	2.48
Bromegrass:									
550	do	34	do	5.51	1.38	32.71	7.63	7.29	1.22

The results of the analyses indicated that the cotton sedges should be harvested during late August and the bluetop and the sedge during late July, if the crops are expected to give maximum yields and maximum feeding value.

KODIAK STATION (KALSIN BAY)

REPORT OF THE ANIMAL HUSBANDMAN

By W. T. WHITE

All the experimental work of the Kodiak station was done at Kalsin Bay. Nineteen Galloway cattle were wintered on the range except during stormy periods, when they were housed and fed native hay.

The Kalsin Bay station was closed June 30, 1931. All equipment and animals were sold except such as could be used at the Matanuska

station. One cow and one heifer of the Galloway breed were transferred to Matanuska for use in crossbreeding with yak.

HAYMAKING

Two small stacks of brown hay were made from beach sedge. The hay was allowed to stand until early spring when it was fed. The heart of the material when cured was hard, dry, and of dark-brown color, and was relished by the cattle. The stacks should be round in form and built as high as practicable to reduce surface spoilage. The test indicated that under adverse weather conditions for haying lush-growing beach sedge may be stacked and cured when it could not otherwise be saved.

SURVEY OF THE MOOSE PASS REGION

In September, 1931, W. T. White, animal husbandman of the Matanuska station, investigated the grazing possibilities of the area along the highway between Moose Pass and Hope, Alaska. The Moose Pass railroad station is at Mile 29 on the Alaska Railroad. A range of mountains extends for 20 miles north of the station and lies parallel between the highway and the railroad. Quartz Creek, Canyon Creek, and Six-Mile Creek, whose valley floors are traversed by the highway, are accessible by a low pass through the mountain range in easterly and westerly directions. The easterly opening of the pass adjoins Moose Pass station at the southwesterly point of Upper Trail Lake.[3]

Moose Pass proper is approximately 6 miles long and from one-half to 3 miles wide. It leads at right angles and directly into Quartz Creek Valley. Quartz Creek flows in a southerly direction into Kenai Lake. The highway continues up the floor of the valley to Summit Lake and over a low divide. Thence the road continues in a northerly direction to upper Canyon Creek, Summit Lake, Lower Canyon Creek, a tributary to Six-Mile Creek, thence down Six-Mile Creek to tidewater at the old mining town of Sunrise, and thence along the shore of Cook Inlet for 9 miles to the village of Hope. From Hope a branch of the highway extends for 4 miles up Resurrection Creek to the mouth of Palmer Creek, thence up Palmer Creek Canyon to the Hirshey Quartz mine.

The area traversed by this highway from Mile 8 to Mile 33 rises rather steeply to the mountains and is cut by precipitous creek and canyon walls. The southern exposures of the mountains and hillsides support a fair stand of grass, largely bluetop (*Calamagrostis* sp.), alder brush, and spruce timber, interspersed with areas of fireweed (*Epilobium angustifolium*). Nonforage plants predominate on the lower levels. The northern slopes are moss covered and support scattering stands of scrub timber of spruce and alder brush. The lower levels contain deposits of glacial gravels with a moderate to thin covering of soil. The slopes and the small flats at the higher levels are rocky and are underlain by a layer of peaty soil 4 to 6 inches deep. The portion of the locality adjoining the highway between Moose Pass station and Quartz Creek offers opportunity for settlement by a

[3] Martin, G. C., Johnson, B. L., and Grant, U. S. Geology and mineral resources of Kenai peninsula, Alaska. U. S. Geol. Survey Bul. 587, 243 p., illus. 1915. (Pl. 11.)

limited number of persons, particularly that part of the pass along the highway between Mile 3 and Mile 8.

An area of approximately 25 square miles of desirable summer range adjoins the highway between Mile 10 and Mile 20, and there is considerable range in the valleys along the south slopes of the tributary creeks, particularly along the east fork of Quartz Creek. From Mile 20, continuing along Canyon Creek to Six-Mile Creek, the valley is very narrow and is hardly more than a canyon, but large grass areas occur upwards of 2,000 feet on the south slopes. The valley floor of Six-Mile Creek widens somewhat downstream, but most of the slopes are to the north and are, in consequence, largely moss covered.

Building logs and small saw timber are available at a number of points along this highway. Spruce and hemlock grow in small stands in the lower valleys and in good stands along the shore of Cook Inlet. From Mile 20 to Mile 44 the vegetation is largely timber, with grass showing only in the burns or on areas from which timber has been removed.

From the town of Hope toward the south 8 miles up Resurrection Creek and its larger tributaries, especially Palmer Creek, there are approximately 30 square miles of range country—largely of timber and browse. About 20 per cent of the area maintains a stand of grass. At the south of both Six-Mile and Resurrection Creeks, where they empty into Cook Inlet, small areas of the soil are made up of alluvial and beach deposits 1 to 3 feet deep. These deposits are underlain by gravel and by small bowlders.

The character of the soil on the southerly slopes from Mile 33 to, and in the vicinity of, Hope is a clay loam 3 inches deep on the higher reaches to more than 3 feet deep at the foot of the slopes. The topsoil is underlain by decomposed rock, shale, and small bowlders, and the mass is often porous. Ridges and dikes of solid rock underlie the topsoil and, on the grass-covered slopes, protrude through it.

Eleven species of forage plants of economic importance grow along the highway. The area covered by the native bluejoint (*Calamagrostis canadensis*) is greater in this region than are the combined areas of the 10 other kinds of plants. Wild barley (*Hordeum boreale*) and bluegrasses (*Poa pratensis* and *P. palustris*) grow in fair-sized stands upwards of 1,000 feet. Sedge (*Carex mertensii*) grows in numerous small stands in swales and in swampy areas between 1,000 and 2,000 feet in elevation. Annual bluegrass (*Poa annua*) grows in widely scattered bunches on the lower, well-drained ridges and benches. Rushes (*Juncus castaneus*) are widely distributed over the Moose Pass area, particularly in swampy and poorly drained areas below the 1,000-foot level. Stands of the grasslike toad rush (*J. bufonius*) grow along the beaches, especially in the vicinity of Hope. *Cinna latifolia* is widely distributed over the Moose Pass region, but only in thin stands, or as scattered plants. Tickle grass (*Agrostis hyemalis*) was observed in a number of localities along the highway at altitudes near the 1,000-foot level. Slender wheatgrass (*Agropyron tenerum*), an introduced species, grows in numerous small stands on well-drained sandy areas near the site of the old village of Sunrise.

Summer range is available over approximately 200 square miles of the area traversed by the Moose Pass Highway between Moose Pass station on the Alaska Railroad and Hirshey mine on Palmer Creek, adjacent to the town of Hope. However, not more than 15 per cent

of the area produces sufficient grass for grazing. Winter forage could be produced in limited quantities on one area of about 6 square miles in the pass, and on another area of 4 square miles in the vicinity of Hope, if the land were cleared and put under cultivation. The whole area could best be utilized as a summer range for sheep if the numerous bears and coyotes there could be exterminated.

Lack of available winter forage offers the greatest disadvantage to successful stock raising in the Moose Pass region. The temperature is not too severe for winter ranging, but snow covers the ground to a depth of 1 or more feet, and during such periods all the stock must be fed.

The highway is closed to automobiles and to trucks during three to five months of the year when the ground is covered with snow.

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